

Duration Limits for Orbital Flight: Current Considerations for the International Space Station

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Introduction: According to ISS documentation, long-duration missions are defined as missions exceeding 30 days. The ISS medical organization has set a 180-day limit for ISS missions from a medical perspective, with a possibility of planning missions of up to 220days with additional consideration. The ISS medical community does not currently consider changes to the existing duration constraints for ISS mission planning. However, longer stays on orbit may be highly desirable or even necessary in certain foreseeable operational circumstances. To develop a methodology for contingency planning, the ISS medical community, led by NASA, has identified medically relevant risks associated with extended stays of crewmembers aboard the ISS.

Material and Discussion: The materials for this presentation consist of meeting protocols, discussion summaries, and other multilateral documents developed in the course of the ISS Increment Duration Extension Project (IDEP), including the current IDEP Risk Mitigations document. Besides the identified risk mitigations for any long-duration mission, the highest priority issues have been defined that must be considered when contemplating an extension of a mission beyond 180 days for any individual crew and crewmember. The list is continuously modified based on expert input from all ISS multilateral expert groups, and currently includes a number of medical, environmental, and behavioral concerns. The list includes the need for enhanced behavioral training and support, optimized radiation dose projections, on-orbit retraining for certain critical activities, extrapolation of toxicological limits to longer exposures, and many others. Mitigation considerations for each risk will be presented and discussed.

Conclusions: Increased durations of low-Earth orbit stays result in medically relevant risk increases that may be substantial and may materialize into medical conditions that impact health, safety, and mission success, in addition to potential long-term health effects.

Learning Objectives: The audience will have the opportunity to hear the current position of the ISS multilateral medical community regarding the highest-priority medical risks associated with extending mission duration beyond the currently established limits. Considerations regarding each of the risk items will be presented and discussed.